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A Revaluation of *Dasyurus bowlingi* Spencer and Kershaw 1910 (Marsupialia, Dasyuridae) from King Island, Bass Strait

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ABSTRACT: A comparison of the subfossil crania and mandibles, on which *Dasyurus bowlingi* Spencer and Kershaw 1910 was erected, with modern and subfossil populations of *Dasyurus maculatus* (Kerr) 1792, leads to the conclusion that the two species are conspecific, and that *D. bowlingi* was described on a male sample of *D. maculatus*.

INTRODUCTION

In 1910 Spencer and Kershaw described a new species of tiger cat, *Dasyurus bowlingi*, from subfossil cranial material collected from King Island, Bass Strait. The dasyurid remains were found, associated with bones of emu, wombat and other modern species, in the calcareous coastal dunes at Surprise Bay on the southwestern corner of the island. In sorting the large dasyurid crania and mandibles, Spencer and Kershaw (1910, p. 30) stated that the material was 'clearly divisible into two sets, a larger and a smaller, indicating the existence of two species . . .'. They assigned the smaller form to *Dasyurus maculatus* and described the larger as *Dasyurus bowlingi*, which was distinguished by its narrower and less swollen auditory bullae as well as by its larger size in cranial and dental dimensions. As further evidence for their division of the subfossil cranial material into two species, Spencer and Kershaw also quoted Péron's record of the presence, in 1802, of two species of dasyurid on King Island (Péron and Freycinet 1816.)

Having compared the subfossil dasyurid specimens from King Island, including the holotype and paratype of *Dasyurus bowlingi*, with samples from modern Victorian and Tasmanian populations of *D. maculatus*, we conclude for reasons given below that *D. bowlingi* and *D. maculatus* are conspecific.

DISTRIBUTION

Dasyurus bowlingi has been recognised only from King Island, though Spencer and Kershaw considered that a single mandible from Deal Island, in eastern Bass Strait, might also belong to this species. Tiger cats were last seen on King Island in 1923 and are thought to be now extinct. Modern specimens collected there have been attributed to *D. maculatus*, and Green and McGarvie (1971) list three skulls held in the Queen Victoria Museum, Launceston, (Nos. 1940/163, 1943/105 and 1967/1/59) and one skin in the National Museum of Victoria (No. C6139) as referable to this latter species. It has generally been assumed that *D. bowlingi* became extinct on King Island in the 19th century along with the emu and wombat, neither of which have been recorded alive there since Péron's report.

Gabriel (1894) included the tiger cat in a list of mammals of the Furneaux Group, and Le Soeuf (1929) stated that a native cat (*D. viverrinus*) was reported 'as still being seen on Flinders and [Cape] Barren Islands'. There are no other records of either species on the eastern islands, and there are apparently no museum specimens from these localities. However two mandibular fragments referable to *D. maculatus* have been recovered near Palana, Flinders Island, from coastal sand dunes which are similar to the dunes of King Island (Hope 1973). Apart from the islands of Bass Strait. *Dasyurus maculatus* occurs as a living species in Tasmania, Victoria, New South Wales and Queensland, possibly as far north as the McIlwraith Range (Tate 1952), and in the southeastern corner of South Australia (Wood Jones 1923-1925).

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It has been recorded fossil from Wellington Caves, New South Wales (Etheridge 1878) and in subfossil deposits from Victoria including Fern Cave near Portland; Mt Hamilton Cave; Bushfield, Tower Hill Beach and Swains Cave near Mt Porndon (Wakefield 1964a, 1967) and at Fromm's Landing rock shelter on the Lower Murray River (Wakefield 1964b). In McEacherns Cave *D.* cf. *D. maculatus* was found in the older '*Sthenurus* Layer' in association with species of *Thylacoleo, Zygomaturus, Protemnodon, Sthenurus,* and *Sarcophilus laniarius* (Wakefield 1967). In Tasmania specimens were found in an aboriginal midden ^{14}C dated at 7080 ± 420 years B.P. (GaK-967) (Gill 1968). It is unknown from Western Australia. Marlow (1958) records it as preferring rain forest and selcrophyll forest.

PÉRON'S OBSERVATIONS

Although Spencer and Kershaw quoted Péron's comments on the fauna of King Island to justify their recognition of two large species of *Dasyurus* there, it is uncertain which species Péron actually saw. He reported (1816, Vol. 2, p. 12-13) that on King Island (November 1802): 'Nous y avons recueilli, M. Lesueur et moi, une foule d'espèce inconnues à l'Europe, parmi lesquelles se trouvent deux Dasyures élégans, . . .'.

At this point a marginal note refers to Plate XXXIII (our Fig. 1) in the first volume of the accompanying Atlas, compiled by Lesueur and Petit. This depicts two animals which are clearly *Dasyurus maculatus.* The same plate is again referred to when Péron comments on the fauna of Ile Decrès (Kangaroo I., S.A.) (January 1803): 'Nous y avons vu que trois espèces de mammiféres: l'une appartient au joli genre des Dasyures' (*Ibid.* Vol. II, p. 76). As Plate XXXIII is mentioned only in connection with the faunas of King and Kangaroo Islands, and as the tiger cats are shown eating the carcase of a seal, circumstance likely on either island, the plate probably depicts a species which was seen by the Baudin expedition on one or both of these islands. However, one cannot place too much confidence in the juxtaposition of Plate XXXIII with the text, as Péron died in 1910, halfway through the compilation of Vol. II, which was completed by Freycinet.

The only other reference to a 'dasyure' made by Péron is where he notes (Vol. I, p. 359) that at Maria Island (27 February 1802): 'Dans la classe des mammiféres, je n'ai pu voir q'une seule espéce de Dasyure, de la grosseur à peine d'une souris'. This specimen was collected and is the type of *Cercartetus nanus* (Desmarest) 1818 according to Wakefield and Warneke (1963). The Baudin expedition did in fact collect several other dasyurids that Péron does not mention, among them the type specimen of *Dasyurus macrourus* Geoffroy 1803, a junior synonym of *Dasyurus maculatus* (Kerr) 1792 (Tate 1947). The type locality of *macrourus* is Port Jackson.

There is no other evidence as to the identity of the 'deux dasyures' seen on King Island, and it is even possible that Péron meant nothing more than that two individual animals (as illustrated in Plate XXXIII) had been seen there.

MATERIAL

All specimens examined are from the collections of the National Museum of Victoria (NMV) unless otherwise indicated. Numbers preceded by the letter P are registered in the palaeontological collections, by C in the zoological collections.

Spencer and Kershaw recorded twenty-five crania and sixty mandibles in the collection they studied. Twenty-one of the crania were assigned to *D. bowlingi,* four to *D. maculatus.* As none of these specimens had been registered (except the holotype and paratypes) we tried to relocate the referred material as accurately as possible. One of us (L.G.M.) found twenty-five relatively complete crania (including holotype and paratypes) from the King Island collection in the National Museum, of which four were recognizably smaller than the rest. As no other complete (or relatively complete) crania were present in the collection and no record of loss or loan of any of the King Island dasyurid material appears in the museum directory (Mr T. A. Darragh, pers. comm.) we can assume with relative certainty that these crania represent the specimens studied by Spencer and Kershaw. The large crania referable to *D. bowlingi* were subsequently registered as P28832, 28836-28841, 28894-28897, 29636-29642 while the holotype (P15101, figured Spencer and Kershaw Pl. 8, fig. 1, p. 32 fig. A) (Pl. 11, fig. 1) and paratypes (P15102, figured Spencer and Kershaw Pl. 8, fig. 2; and P25940) (Pl. 11, figs. 2-3) were already numbered. P25940 has recently been selected as a paratype by Dr W. D. L. Ride and Mr T. A. Darragh because it was one of two specimens (the other being the holotype) which had a complete auditory bulla as discussed by Spencer and Kershaw (Pl. 11, fig. 3). Specimens P29641-29642 are represented only by the palate region; the cranial portion is missing. The four smaller skulls are assumed to be those assigned to *D. maculatus* by Spencer and Kershaw and are registered as P28833-28835 and P29635. In addition, cranial

FIG. 1—Plate XXXIII from Lesueur and Petit's Atlas accompanying Péron and Freycinet (1807-1816) *Voyage de découvertes aux Terres Australes.* By courtesy of the R. G. Menzies Library, Australian National University.

fragments representing a minimum of three other individuals were present in the collection. These specimens were also without registration numbers and whether they were present when Spencer and Kershaw described the material or were added at a later date is unknown.

Spencer and Kershaw assigned 37 of the mandibles in their King Island collection to *D. bowlingi* and 29 to *D. maculatus*. (Although this totals 66, they give 60 as the sum of the mandibles, including the single specimen from Deal I.). In the NMV collection, however, a total of 90 mandibles are present, and the source of the additional 24 (or 30) is unknown. As with the crania, all were unregistered, except the paratypes, P15111 and P15112 (Spencer and Kershaw, *Ibid*. Pl. 8, figs. 4 and 5 respectively) (Pl. 12, figs. 1-2). The specimen noted by Spencer and Kershaw as coming from Deal Island could not be located, and it has probably been inadvertently mixed in with the King Island material. For the purposes of this study, seventeen representative mandibles were selected and given numbers P28898-28912.

Victorian specimens referred to *D. maculatus* include C1010, C2165, C2981, C6144, C6145, C6180, C7921, C8170, C9561, P7425, P7426, P28914-28919 (Pl. 11, fig. 4; Pl. 12, fig. 3). This sample includes a mixture of both male and female specimens although most are unsexed. The last eight specimens are from Holocene cave deposits. Specimen P7425 and 7426 represent the syntypes of *D. affinis* (= *D. maculatus;* see Mahoney 1964), and P28914-28919 were collected from a cave on the Point Addis Oil Lease in Western Victoria by Dr G. B. Pritchard (Pl. 11, fig. 4; Pl. 12, fig. 3). The Tasmanian sample consists of specimens C6115-6117, C6126, C6129, C6134, C6135, C6137, C6138; all of which are male.

A fossil cranial fragment in the collections of the Australian Museum (AM F54701) from western New South Wales was available for study. This specimen consists of most of the rostrum, the left cheek tooth series and the anterior part of the right maxilla, and associated left and right mandibles (Pl. 12, figs. 4-5). It was collected by Mr H. Allen, Department of Prehistory, A.N.U., from an Aboriginal hearth eroding out of consolidated dune deposits at the northern end of the dry Lake Mulurulu, on Willandra Creek, N.S.W. The dune deposits are more than 15,000 and probably about 24,000 years old (J. M. Bowler pers. comm.).

The following measurements were made on the crania and mandibles:– maximum length (L) and width (MW) of all premolars and molars, length of molar tooth row (M^{1-3} for upper teeth, M_{1-4} for lower), basal length and zygomatic breadth of skull and the depth and breadth of the horizontal body of the mandible taken on labial side below M_3.

The basal length of skull was measured from anterior edge of canine to posterior edge of occipital condyles and is not to be confused with the more conventional measurement of posterior edge occipital condyles to anterior edge I^1. The former measurement was used because most of the King Island specimens lacked the premaxillary region.

All measurements are in millimeters.

AUDITORY BULLAE

Spencer and Kershaw (*Ibid.*, p. 32) used differences in the morphology of the auditory bullae to separate *D. bowlingi* and *D. maculatus*. They noted that in *D. viverrinus* the bullae are 'very largely inflated, the breadth of the bullae being at least three-quarter the length' while 'in *D. maculatus* the expansion of the bullae is not so great, the breadth being slightly more than half the length'. The bullae of *D. bowlingi* they recorded as 'more elongated and much less swollen'. Illustrations of these three types were given in Figures C, B and A respectively. Two specimens of *D. bowlingi* were recorded as having the auditory bullae (mastoid bullae of Spencer and Kershaw) sufficiently preserved to show the structure. As only P15101 (holotype) and P25940 (paratype) of the King Island specimens have this feature well preserved, these presumably are the specimens referred to. These were compared with all specimens of *D. maculatus* studied, and the bullae were found to vary greatly both in size and morphology. No differences, for example, could be observed between P25940, *D. bowlingi* and C7921, *D. maculatus* from Victoria.

The best example of bullae variation is seen in a modern specimen of *D. maculatus* (C6140) collected from Daintree River, Queensland (Pl. 12, fig. 6). The left bulla is large and inflated, and agrees perfectly with Figure B (*D. maculatus*) of Spencer and Kershaw; while the right bulla is narrow and less swollen than the left and agrees closely with their Figure A or *D. bowlingi* (holotype P15101). With such marked variation within a single individual, differences between individuals are to be expected.

CRANIAL AND DENTAL COMPARISONS

The cranial and dental measurements of the specimens from King Island, including three of the smaller crania (P28833-28835), the modern and subfossil sample of *Dasyurus maculatus* from Victoria, and the modern sample of *D. maculatus*

TABLE 1

Population parameters for some tooth an cranial dimensions of *Dasyurus maculatus* (subfossil and living) from Victoria; *D. "bowlingi"* (subfossil), King Island; and *D. maculatus* (living), Tasmania

Tooth dimension	D. maculatus, Victoria					D. "bowlingi", King Island					D. maculatus, Tasmania				
	N	O.R.	M	s	V	N	O.R.	M	s	V	N	O.R.	M	s	V
Upper cheek teeth															
P^1 length	13	3.0-3.8	3.40	.245	7.21	17	2.9-3.8	3.36	.296	8.80	8	3.0-3.5	3.28	.158	4.82
max. width	13	1.5-2.0	1.75	.166	9.49	17	1.6-2.3	1.98	.188	9.49	8	1.7-2.1	1.88	.149	7.93
P^2 length	13	3.6-4.6	4.18	.300	7.17	17	3.9-4.7	4.44	.240	5.41	9	3.7-4.5	4.04	.240	5.94
max. width	13	2.1-2.9	2.50	.265	10.60	17	2.5-3.1	2.79	.200	7.17	9	2.5-2.8	2.69	.127	4.72
M^1 length	13	5.4-6.8	6.02	.462	8.01	17	5.9-6.5	6.15	.203	3.30	9	5.6-6.1	5.90	.187	3.17
max. width	13	3.8-5.0	4.22	.389	9.22	17	4.5-5.1	4.76	.158	3.32	9	4.1-4.5	4.33	.150	3.46
M^2 length	13	6.0-7.1	6.54	.310	4.74	17	6.3-6.8	6.59	.168	2.55	9	6.2-6.7	6.40	.173	2.70
max. width	13	4.7-6.1	5.32	.479	9.00	17	5.4-6.1	5.78	.210	3.63	9	5.3-5.7	5.44	.133	2.45
M^3 length	13	6.2-7.3	6.82	.352	5.16	17	6.7-7.4	7.02	.195	2.78	9	6.6-7.0	6.79	.154	2.27
max. width	13	5.7-7.1	6.45	.416	6.45	17	6.2-6.8	6.58	.205	3.12	9	5.8-6.5	6.27	.212	3.38
M^4 length	13	6.3-7.5	6.87	.419	6.10	17	6.7-8.0	7.43	.346	4.66	9	6.4-7.2	6.88	.295	4.29
max. width	13	2.1-2.8	2.40	.252	10.50	17	2.2-3.0	2.65	.203	7.66	9	2.1-2.6	2.33	.173	7.43
M^1–M^3 length	13	17.7-20.8	19.23	1.048	5.45	17	18.8-21.0	20.04	.560	2.79	9	18.0-20.2	19.04	.637	3.35
Lower cheek teeth															
P_1 length	11	3.6-4.2	3.90	.155	3.97	14	3.0-4.2	3.89	.308	7.92	9	3.8-4.1	3.93	.112	2.85
max. width	11	1.7-2.0	1.86	.129	6.94	14	1.7-2.3	2.06	.160	7.77	9	1.8-2.0	1.96	.0726	3.70
P_3 length	13	3.9-4.7	4.28	.203	4.74	17	3.9-4.7	4.34	.218	5.02	9	4.0-4.3	4.16	.101	2.43
max. width	13	1.9-2.6	2.25	.211	9.38	17	2.1-2.6	2.40	.137	5.71	9	2.2-2.4	2.29	.0782	3.42
M_1 length	15	4.5-5.5	4.92	.305	6.20	17	4.8-5.6	5.22	.230	4.41	9	4.6-5.3	4.83	.224	4.64
max. width	15	2.7-3.3	3.01	.179	5.95	17	3.1-3.5	3.29	.139	4.22	9	3.0-3.2	3.12	.0833	2.67
M_2 length	15	5.3-6.5	5.87	.411	7.00	17	5.6-6.6	6.16	.272	4.42	9	5.6-6.0	5.82	.120	2.06
max. width	15	3.2-4.0	3.59	.245	6.82	17	3.6-4.3	3.88	.194	5.00	9	3.4-4.0	3.63	.173	4.77
M_3 length	14	5.9-7.0	6.33	.407	6.43	17	6.3-6.9	6.61	.152	2.30	9	6.1-6.7	6.36	.207	3.26
max. width	14	3.3-4.4	3.81	.296	7.77	17	3.9-4.4	4.12	.170	4.13	9	3.7-4.0	3.84	.129	3.23
M_4 length	15	6.0-7.0	6.51	.358	5.50	17	6.5-7.2	6.81	.196	2.88	9	6.3-6.8	6.53	.180	2.76
max. width	15	3.3-4.0	3.70	.217	5.86	15	3.7-4.3	3.98	.190	4.77	9	3.6-3.8	3.72	.0972	2.61
M_1–M_4 length	15	18.8-25.4	23.39	1.752	7.49	17	23.5-26.0	24.89	.845	3.39	9	23.0-25.0	23.81	.670	2.81
Breadth of mandible below M_3	15	4.2-6.7	5.17	.628	12.15	17	4.7-7.2	5.93	.870	14.67	9	4.8-5.6	5.20	.296	5.69
Depth of mandible labial side M_3	15	10.5-16.1	12.56	1.729	13.77	17	11.7-17.0	14.54	1.970	13.55	9	12.9-16.0	14.29	1.090	7.63
Breadth of Zygomatic Arch	10	48.5-71.0	61.82	8.032	12.99	17	54.0-73.0	66.69	6.262	9.39	9	59.4-68.0	64.41	2.89	4.49
Basal length of skull ant. edge of canine to post. edge of occipital condyles	12	75.0-109.0	95.15	11.420	12.00	17	84.0-112.7	102.15	9.468	9.27	9	90.0-106.0	98.39	5.29	5.38

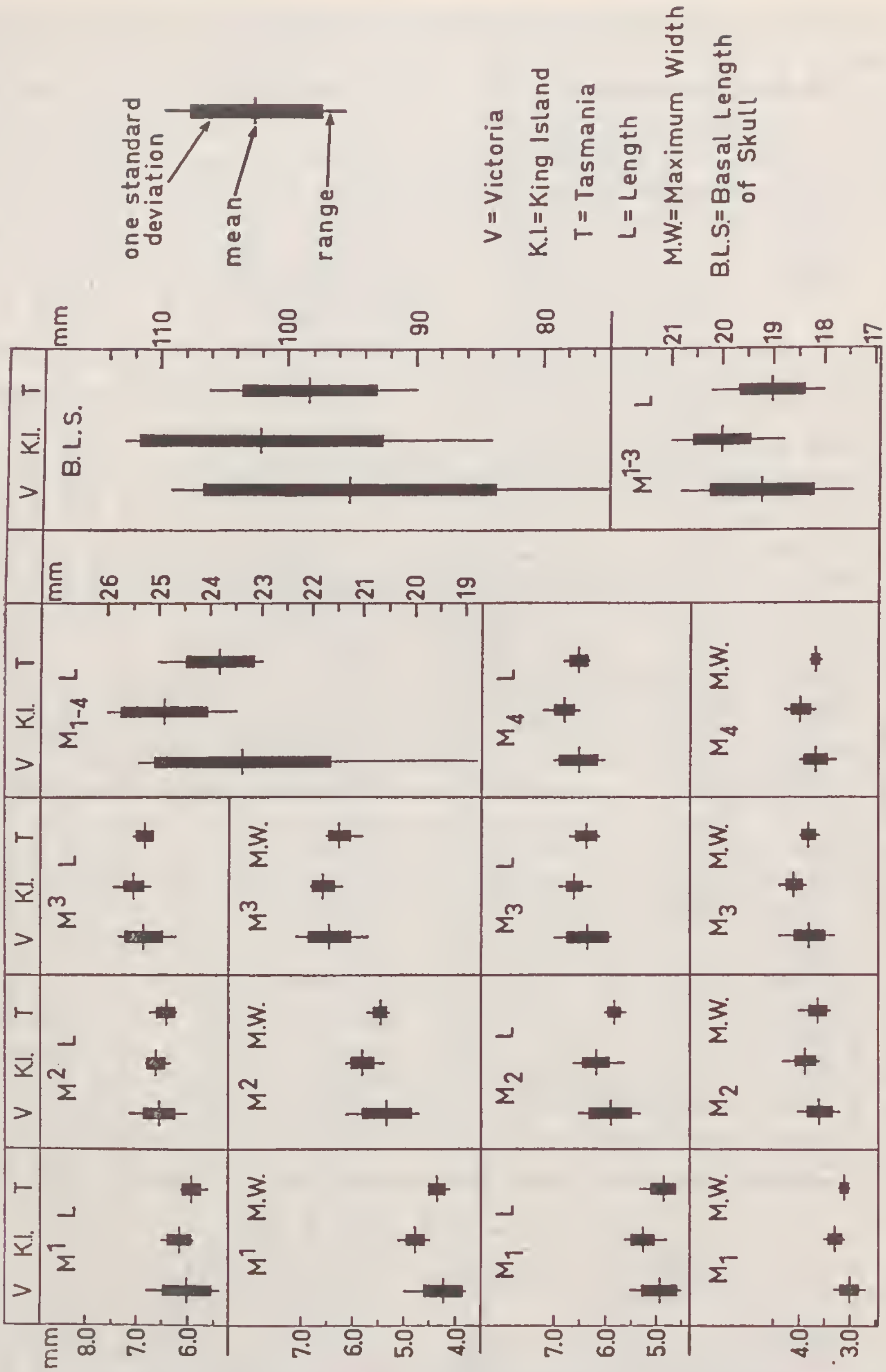

FIG. 2—Bar diagram comparing dental and cranial dimensions of a modern male sample of *Dasyurus maculatus* from Tasmania, a modern and subfossil sample of *D. maculatus* from Victoria, and a subfossil sample of *D. bowlingi* from King Island, Bass Strait.

from Tasmania are given in Table 1. Means, standard deviations and coefficients of variation were determined following the procedures set out by Simpson et al. (1960). Several measurements are shown graphically in Fig. 2.

The means for each character are very similar in all three populations and there is considerable overlap in the ranges, but the specimens from King Island tend to be slightly larger than those from the other localities. The coefficients of variation of tooth dimensions of the mixed Victorian sample range from 3·97 – 10·60, with most lying between 5 and 8. The range is equally wide in the King Island sample, from 2·30 to 9·49, with the the majority in this case lying between 2 and 6. For the cranial and mandibular dimensions, the coefficients of variation of both these populations are much greater, ranging from 12·00 to 13·77 in the Victorian sample and from 9·27 to 14·67 in the King Island sample. In contrast, the coefficients of variation for the Tasmanian sample range from 2·61 – 7·93 for the tooth dimensions, 2-4 occurring most frequently, and from 4·49 to 7·63 for the cranial and mandibular dimensions. This variation is about half that of the Victorian sample. As the Tasmanian sample consists entirely of males, the greater variability in the other two samples may be the result of a marked sexual dimorphism.

In the Victorian sample a single specimen was labeled as female (C8170) and three (C6180, C2981, C2165) as male. The lengths of M^{1-3}, zygomatic breadth, and basal length of skull of the female are 17·7, 48·5, and 75·0 respectively; for the three males the equivalent measurements are 19·4, 18·6, 19·2; no measurement, 62·5, no measurement; 99·0, 95·0, 95·5. Although this sample is small, a marked size difference is evident between the two sexes, with the female being the smaller.

Sexual dimorphism is common among dasyurids. Green (1967) found that males of *D. viverrinus* and *Sarcophilus harrisii* from Tasmania were significantly larger in cranial dimensions and overall body size than females. In both species females had a body weight about one-third less than males. A significant sexual dimorphism was also found in *Thylacinus cynocephalus* in which females were smaller than males (Ride 1964). Here the disparity in size was so marked that there was no overlap of measurements in seven of the eight characters considered. Among the smaller dasyurids sexual dimorphism in both body size and cranial dimensions has been found in *Antechinus flavipes, A. godmani, A. minimus, A. stuartii*, and *A. swainsonii*, males being larger than females in all cases (Wakefield and Warneke 1963, 1967).

The effect of the three smaller crania (P28833-28835) upon the ranges of the various measurements of the King Island sample is most clearly seen in the basal length and zygomatic breadth of the skull. The ranges of these two measurements for the three smaller specimens are 84·0 – 87·0 and 54·0 – 57·0 respectively, while the smallest specimens in the remainder of the King Island sample measure 96·0 (P28836) and 63·5 (P28895) respectively. When the three smaller skulls are omitted from the sample, the range of coefficients of variation of the King Island sample of large skulls (*D. bowlingi*) is almost identical with the male sample from Tasmania.

The sexual dimorphism shown in modern Victorian specimens of *D. maculatus* and the close similarity of range and coefficients of variation of the *D. bowlingi* sample to the male Tasmanian sample of *D. maculatus* suggests that *D. bowlingi* was erected on a subfossil sample of males of *D. maculatus*, and the smaller skulls in the King Island collection are those of females. Spencer and Kershaw (1910, p. 32) considered this possibility but at that time no adequate studies on sexual dimorphism had been made on the dasyurids or related species. The distribution of the King Island sample into 'two sets' were thus interpreted as representing specific differences.

On the foregoing evidence, *Dasyurus bowlingi* Spencer and Kershaw 1910, is recorded here as a junior subjective synonym of *Dasyurus maculatus*.

A certain degree of bias is present in Spencer and Kershaw's presentation and deserves comment. Firstly, their table (*Ibid.* p. 30) comparing basal length of skull was constructed using integers of 10 mm for *D. viverrinus* and *D. maculatus* and of 5 mm for their King Island specimens, giving an impression of a greater range of size in the latter than was real. Secondly, the holotype (P15101) is the longest specimen in basal length (112·7 mm) and second only to P28838 in zygomatic breadth (72·2 and 73·0 respectively). Good preservation of the right auditory bulla in P15101 may be argued in favour of the choice of this specimen as the holotype.

In general, the specimens from King Island tend to be larger than those from Victoria or Tasmania. But of the 15 cranial upper teeth measurements of the mixed Victorian sample, the three subfossil specimens from the Point Addis Oil Reserve, Victoria, mark the upper limits in 13 cases. If these specimens (P28914-16) are compared with the holotype (P15101) and paratypes (P15102, 25940) of *D. bowlingi* (Table 2) a striking similarity is seen. In fact, the subfossil Victorian specimens are larger than the King Island speci-

TABLE 2

Selected cranial and cheek tooth dimensions of *D. "bowlingi"* from King Island compared with subfossil specimens of *D. maculatus* from Victoria and a late Pleistocene specimen from New South Wales

Specimen	P 1		P 2		M 1		M 2		M 3		M 4		M^{1-3} / M_{1-4}	Zygomatic breadth	Basal length of skull
	L	MW	L	MW	L	MW	L	MW	L	MW	L	MW			
Upper cheek teeth															
D. "bowlingi"															
P15101 (Holotype)[a]	3.4	2.0	4.7	2.7	6.2	4.7	6.8	5.7	7.1	6.6	8.0	2.4	20.5	72.7	112.7
P15102 (Paratype)[a]	3.0	2.0	4.2	2.8	6.2	4.8	6.7	6.0	7.0	6.7	7.7	2.6	19.9	71.3	106.8
P25940 (Paratype)[a]	3.4	2.3	4.5	3.0	6.5	4.8	6.8	6.0	7.2	6.8	7.6	2.7	20.1	72.2	106.0
D. maculatus															
P28914[b]	3.6	2.0	4.6	2.9	6.7	5.0	6.9	6.1	7.1	7.1	7.0	2.7	20.3	71.0	109.0
P28915[b]	3.4	2.0	4.6	2.9	6.8	4.8	6.8	6.0	7.3	6.7	7.5	2.6	20.8	71.0	104.0
P28916[b]	3.8	2.0	4.6	2.8	6.6	4.6	6.7	5.8	7.3	6.9	7.2	2.7	20.3	65.0	109.0
AM F54701[c]	3.7	2.0	4.6	3.0	-	-	7.0	6.1	7.1	7.2	8.0	2.6	20.9[d]	-	-
Lower cheek teeth															
D. "bowlingi"															
P15111[a]	-	-	4.1	2.6	5.2	3.1	6.6	3.9	6.7	4.2	7.0	4.2	24.8	-	-
P15112[a]	-	-	4.2	2.4	5.6	3.4	6.5	4.0	6.7	4.1	7.0	4.0	25.7	-	-
D. maculatus															
P28917[b]	3.9	2.0	4.2	2.4	5.2	3.2	6.3	3.8	6.8	3.8	7.0	3.8	25.1	-	-
P28918[b]	-	-	4.7	2.6	5.4	3.3	6.5	4.0	6.9	4.4	7.0	4.0	25.2	-	-
P28919[b]	4.0	2.0	4.4	2.6	5.5	3.3	6.4	3.8	7.0	4.1	6.8	3.9	25.4	-	-
AM F54701 (left)[c]	-	-	-	-	-	-	6.6	4.3	7.0	4.4	7.2	4.4	-	-	-
AM F54701 (right)[c]	-	-	-	-	-	-	6.6	4.1	7.0	4.4	7.3	4.4	-	-	-

abbreviations: L, length; MW, maximum width.

[a] King Island, Bass Strait

[b] Holocene cave, Point Addis Oil Reserve, Victoria

[c] Lake Mulurulu, New South Wales

[d] approximate

mens in 10 of the 15 characters considered. The presence of these large subfossil specimens in the Victorian sample may contribute as much to the exceptionally high variability of the latter as does the sexual dimorphism of the population. However the modern and subfossil specimens from Victoria are not separable on other morphological grounds and their treatment as a single sample is believed justified.

Similarly the Pleistocene specimen from Lake Mulurulu, N.S.W., is larger than the holotype and paratypes of *D. bowlingi* in five upper tooth measurements and equal or smaller in six (Table 2).

With respect to lower teeth measurements, the two paratypes of *D. bowlingi* (P15111, 15112) are also comparable directly with the three subfossil mandibles of *D. maculatus* from Victoria (P28917-28919), and the late Pleistocene mandibles from Lake Mulurulu, New South Wales (Table 2). The subfossil Victorian specimens are equal to or larger than *D. bowlingi* in six of the eleven characters compared; while the Mulurulu specimen is equal in one and larger in five of the six characters compared.

The taxonomic status of two other large dasyurids deserves comment. *Dasyurus affinis* McCoy, 1865 was 'erected by a note on a Geological Survey of Victoria Sheet & N.W.' in a list of mammals from the Bone Cave S. by E. of Gisborne, Victoria (Mahoney 1964). The syntypes, two left mandibles (P7425, 7426) agree in size and morphology with *D. maculatus* and the species is recognised as a junior synonym of the latter (*Ibid.* p. 526). These mandible are considerably smaller than the specimens just discussed and may represent females, or the deposit may be younger in age. The age of Gisborne Cave is considered as Holocene (Gill, in appendix of Mahoney 1964).

Dasyurus gracilis was long thought to be a small Queensland form closely related to *D. maculatus,* but specifically distinct. The type specimen is a young juvenile in which M^4 is not yet erupted (AM M155). Tate (1952) considered it as conspecific with *D. maculatus* on the basis of a large number of specimens representing a complete growth series. Having examined specimens of *D. maculatus* from Queensland (C6140, 6141) which are regarded as representing the '*gracilis*' race, we concur with Tate's conclusion.

Dasyurus dunmalli, from the late Pliocene Chinchilla Sand of southern Queensland, is similar in size and morphology to *D. viverrinus* (Bartholomai 1971), and *Dasyurus mordax* (Owen 1877, Pl. V, fig. 10) also seems to be closer to the smaller species of *Dasyurus* than to *D. maculatus.*

DISCUSSION

It seems probable that the late Pleistocene-early Recent mainland population and the isolated, but modern population on King Island were both slightly larger than the modern mainland and Tasmanian ones. It may be that *Dasyurus maculatus* provides another example of post- Pleistocene dwarfing as has been suggested for other species. For example, Lydekker (1887) suggested that *Sarcophilus laniarius* of the late Pleistocene may have been directly ancestral to the smaller modern species *S. harrisii.* He also proposed a similar phyletic line for *Macropus titan – M. giganteus* and *Osphranter altus* (= *O. cooperi*) – *O. robustus. Macropus siva* may similarly represent a larger Pleistocene form of *M. agilis* and *Wallabia vishnu* of *W. bicolor* (A. Bartholomai, pers. comm.).

However such differences in size may also be attributable to geographic factors. For example, Ride (1964) has shown that while fossil *Thylacinus cynocephalus* from eastern Australia are slightly larger than the modern Tasmanian ones, the fossil population from western Australia was smaller than both the eastern fossil or the modern population. The larger specimen of *D. maculatus* from Lake Mulurulu, N.S.W. is particularly relevant in this respect, as it was found in a context atypical of modern populations of the species. It was collected in association with a suite of species, including *Bettongia penicillata, B. lesueur, Lagorchestes* sp. and *Onychogalea* sp., suggestive of a semi-arid environment. Modern *Dasyurus maculatus* has never been recorded from such a habitat, and prefers much wetter conditions. However Lake Mulurulu contained water at the time and a riparian woodland may have grown on its shores, as Tedford (1967) has suggested for nearby Lake Menindee.

The subfossil specimens of *D. maculatus* from King Island are certainly not of Pleistocene age. Extinct marsupials including *Zygomaturus trilobus, Protemnodon anak* and *Diprotodon optatum,* have been recorded from swamp deposits in the north of King Island, and others, including *Sthenurus occidentalis,* have been found embedded in older, consolidated dunes at Surprise Bay (Hope 1973). However the remains of *D. maculatus* are all from younger unconsolidated dunes and are associated with modern species. These include some, such as *Macropus rufogriseus* and *Thylogale billardierii,* which are still present on King Island, and others, such as *Vombatus ursinus* and the King Island emu, *Dromaius ater,* which although now extinct there, were recorded alive on the island in 1802 (Péron and Freycinet 1816). The younger dunes of King Island are probably of Holocene age

(Jennings 1959), and the subfossils found in them are of comparatively recent age, as the species concerned are those still present on the islands or ones which have become extinct within historic times.

Variations in body size are very common in island populations of mammals. Foster (1964) has summarised the trends in different groups and has found that rodents tend to increase in body size when isolated, while other mammals such as carnivores and artiodactyls tend to diminish in size. There are several recorded examples of island populations of marsupials which are smaller in size, such as the form of *Isoodon obesulus* found on two islands of the Nuyts Archipelago, S.A. (Wood Jones 1923-1925) but none, that we are aware of, where an increase in body size has occurred. Other marsupial species on the islands of Bass Strait such as *Potorous apicalis* and *Thylogale billardierii* tend to be smaller than their mainland counterparts (Hope 1973). At first sight, the large size of the tiger cat on King Island seems an unexpected reverse of this trend. However increases in body size in insular rodent species have been attributed to a lack of competitors (e.g. Corbet 1964) which has enabled the insular species to utilise a wider range of habitats.

On King Island, *D. maculatus* had no competition, as the larger predators such as *Thylacinus cynocephalus*, *Sarcophilus laniarius* and the dingo were absent, and was probably able to exploit larger sized prey (and carrion?) species. Lesueur and Petit's illustration of two tiger cats eating a seal carcase is of interest in this context. Larger size would presumably be a favourable development for the tiger cat in this situation.

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EXPLANATION OF PLATES

PLATE 11

FIGS. 1-3—*Dasyurus bowlingi* Spencer and Kershaw. 1. P15101 (holotype). 2. P15102 (paratype). 3. P25940 (paratype). All dorsal views. King Island, Bass Strait.

FIG. 4—*Dasyurus maculatus* (Kerr). P28915, dorsal view. From cave on Point Addis Oil Lease, Victoria.

PLATE 12

FIGS. 1-2—*Dasyurus bowlingi* Spencer and Kershaw. 1. P15111 (paratype). 2. P15112 (paratype). Both labial views of right mandible. King Island, Bass Strait.

FIGS. 3-6—*Dasyurus maculatus* (Kerr). 3. P28918, from cave on Point Addis Oil Lease, Victoria. Labial view of left mandible. 4. AM F54701, labial view of right mandible. 5. AM F54701, dorsal view of rostrum; from Lake Mulurulu, southwestern New South Wales. 6. C6140, ventral view of cranium; from Daintree River, Queensland. Note the disproportionate size of the auditory bullae.